

ABSTRAK

PENGARUH TEKANAN UDARA DAN LAJU ALIR PADA *PRETREATMENT* BERBASIS FEROLITE TERHADAP PENINGKATAN KINERJA ULTRAFILTRASI AIR SUMUR MENJADI AIR MINUM

(Reno Saputra, 2026, Halaman 73, Tabel 14, Gambar 17, Lampiran 4)

Air merupakan kebutuhan mendasar bagi kehidupan manusia yang berperan penting dalam menunjang berbagai aktivitas, baik untuk keperluan domestik maupun konsumsi. Salah satu sumber air baku yang banyak dimanfaatkan oleh masyarakat adalah air sumur. Namun, kualitas air sumur umumnya belum memenuhi standar air minum karena masih mengandung kontaminan seperti besi (Fe), mangan (Mn), kekeruhan, dan mikroorganisme. Oleh karena itu, diperlukan proses pengolahan yang efektif melalui tahapan pretreatment sebelum proses membran untuk meningkatkan kualitas air baku. Penelitian ini bertujuan menganalisis pengaruh variasi laju alir (6, 8, 10, 12, dan 14 L/menit) dan tekanan udara aerasi (3, 4, dan 5 bar) pada pretreatment berbasis Ferolite terhadap kinerja ultrafiltrasi dalam pengolahan air sumur menjadi air minum. Tahapan proses meliputi aerasi, filtrasi menggunakan media Ferolite dan karbon aktif, kemudian dilanjutkan dengan proses ultrafiltrasi menggunakan membran hollow fiber. Parameter kualitas air yang dianalisis meliputi pH, Total Dissolved Solids (TDS), kekeruhan, besi (Fe), mangan (Mn), serta parameter mikrobiologi. Hasil penelitian menunjukkan bahwa variasi laju alir dan tekanan udara berpengaruh terhadap efektivitas penurunan kontaminan. Kondisi operasi terbaik diperoleh pada laju alir 8 L/menit dan tekanan udara 4 bar, dengan nilai pH sebesar 6,9, TDS 96 mg/L, kekeruhan 0,59 NTU, kadar Fe 0,0058 mg/L, dan kadar Mn 0,0160 mg/L. % rejeksi Membran Ultrafiltrasi pada kondisi optimum mencapai 86,60% untuk Fe, 68,4% untuk Mn, dan 83,61% untuk kekeruhan. Selain itu, hasil pengujian mikrobiologi menunjukkan bahwa air hasil ultrafiltrasi tidak mengandung Total Coliform maupun *Escherichia coli* (0 CFU/100 mL), sehingga memenuhi persyaratan kualitas air minum berdasarkan Peraturan Menteri Kesehatan Republik Indonesia Nomor 2 Tahun 2023. Dengan demikian, kombinasi pretreatment berbasis aerasi dan Ferolite yang diintegrasikan dengan ultrafiltrasi terbukti efektif dalam meningkatkan kualitas air sumur menjadi air minum..

Kata Kunci : Aerasi, Ferolite, Laju Alir, Tekanan Udara, Ultrafiltrasi

ABSTRAK

THE EFFECT OF AIR PRESSURE AND FLOW RATE IN FEROLITE-BASED PRETREATMENT ON IMPROVING THE PERFORMANCE OF ULTRAFILTRATION OF WELL WATER INTO DRINKING WATER

(Reno Saputra, 2026, Pages 73, Tables 14, Figures 17, Attachments 4)

Water is a basic need for human life that plays an important role in supporting various activities, both for domestic and consumption purposes. One source of raw water widely used by the community is well water. However, the quality of well water generally does not meet drinking water standards because it still contains contaminants such as iron (Fe), manganese (Mn), turbidity, and microorganisms. Therefore, an effective treatment process is needed through a pretreatment stage before the membrane process to improve the quality of raw water. This study aims to analyze the effect of variations in flow rates (6, 8, 10, 12, and 14 L/min) and aeration air pressure (3, 4, and 5 bar) in Ferolite-based pretreatment on ultrafiltration performance in processing well water into drinking water. The process stages include aeration, filtration using Ferolite media and activated carbon, then continued with the ultrafiltration process using a hollow fiber membrane. The water quality parameters analyzed include pH, Total Dissolved Solids (TDS), turbidity, iron (Fe), manganese (Mn), and microbiological parameters. The results of the study showed that variations in flow rate and air pressure affected the effectiveness of contaminant reduction. The best operating conditions were obtained at a flow rate of 8 L/min and an air pressure of 4 bar, with a pH value of 6.9, TDS 96 mg/L, turbidity 0.59 NTU, Fe content 0.0058 mg/L, and Mn content 0.0160 mg/L. The % rejection of the Ultrafiltration Membrane at optimum conditions reached 86.60% for Fe, 68.4% for Mn, and 83.61% for turbidity. In addition, the results of microbiological testing showed that the ultrafiltration water did not contain Total Coliform or Escherichia coli (0 CFU/100 mL), thus meeting the drinking water quality requirements based on the Regulation of the Minister of Health of the Republic of Indonesia Number 2 of 2023. Thus, the combination of aeration and Ferolite-based pretreatment integrated with ultrafiltration has proven effective in improving the quality of well water into drinking water.

Keywords : *Aeration, Air Pressure, Ferrolite, Flow Rate, Ultrafiltration.*